

CLAIMS

What Is Claimed Is:

- 5                   1.     An integrated optics encryption device comprising a coherent light source connected to a wave guide with a controllable refractive index; the wave guide comprising a message signal input and a key signal input.
2.     The integrated optics encryption device of Claim 1 where the wave guide produces "exclusive or" functionality based on the message signal input and the key signal input.
- 10                  3.     The integrated optics encryption device of Claim 1 where the coherent light source is a laser diode.
4.     The integrated optics encryption device of Claim 1 where the wave guide further comprises an encrypted message signal output.
- 15                  5.     An integrated optics encryption device comprising a coherent light source connected to a multi-functional integrated optics chip, said multi-functional integrated optics chip comprising a message signal input and a key signal input.
6.     The integrated optics encryption device of Claim 5 where the multi-functional integrated optics chip comprises at least two divergent paths, each path comprising an end.
- 20                  7.     The integrated optics encryption device of Claim 6 further comprising a loop connected to the multi-functional integrated optics chip at the end of each path.
8.     The integrated optics encryption device of Claim 6 wherein each end is mirrored.

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10. The integrated optics encryption device of Claim 5 where at least one signal generating means is connected to the message signal input and at least one signal generating means is connected to the key signal input.

12. The integrated optics encryption device of Claim 6 where the message signal input is connected to one path and can reversibly alter the refractive index of the path to which it is connected and the key signal input is connected to one path and can reversibly alter the refractive index of the path to which it is connected.

14. The integrated optics encryption device of Claim 13 where the message signal input is connected to one path and can reversibly alter the refractive index of the path to which it is connected and the key signal input is connected to the other path and can reversibly alter the refractive index of the path to which it is connected.

15. The integrated optics encryption device of Claim 13 where at least one signal generating means connected to the key signal input is a random number generator.

5 16. The integrated optics encryption device of Claim 13 where the coherent light source is a laser.

17. The integrated optics encryption device of Claim 13 where the coherent light source is a laser diode.

10 18. An integrated optics encryption device comprising means for generating a coherent light signal connected to a multi-functional integrated optics chip comprising a message signal input, a key signal input, an encrypted message output, and means for producing "exclusive or" functionality based on the message signal input and the key signal input.

15 19. The integrated optics encryption device of Claim 18 further comprising at least one signal generating means connected to the message signal input and at least one signal generating means connected to the key signal input and where the means for producing "exclusive or" functionality based on the message signal input and the key signal input comprises means for dividing the coherent light signal into two divergent paths with mirrored ends and means for altering a refractive index of the paths.

20 20. The integrated optics encryption device of Claim 18 wherein the message signal input further comprises means for reversibly altering a refractive index of one path and wherein the key signal input further comprises means for reversibly altering a refractive index of another path.

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21. The integrated optics encryption device of Claim 19 wherein at least one signal generating means connected to the key signal input is a random number generator.

5 22. A method for encryption using interference from a coherent light source comprising the steps of:

issuing a coherent light signal from a coherent light source to a multi-functional integrated optics chip;

dividing the coherent light signal into two paths within the multi-functional integrated optics chip;

10 issuing pre-determined signals to the two paths of the multi-functional integrated optic chip where a message signal input is attached to one path of the multi-functional integrated optics chip and a key signal input is attached to the other path;

15 recombining the divided light signal to create an encrypted signal; and,

outputting the encrypted signal via an encrypted message output.

23. The method of claim 22 where the message signal input and key signal input reversibly alter the refractive index of the path to which each input is connected.

20 24. The method of Claim 22 where the key signal input is connected to a random number generator.

25. The method of Claim 22 where each path has a mirrored end.

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issuing a coherent light signal from a coherent light source to a multi-functional integrated optics chip;

issuing pre-determined signals to the two paths of the multi-functional integrated optic chip where an encrypted message signal input is attached to one path of the multi-functional integrated optics chip and a key signal input is attached to the other path;

recombining the divided light signal to create a message signal; and,  
outputting the message signal via a message signal output.